Claims

What is claimed is:

1. A communications link for a cellular communications system, comprising:

a first airplane for flying in a first pattern and including a first antenna for transmitting RF beams to form a first footprint on a first target geographic area to provide cellular phone users within the footprint with a first communications link; and

a second airplane for flying in a second pattern and including a second antenna for transmitting RF beams to form a second footprint on a second target geographic area to provide cellular phone users within the second footprint with a second communications link;

said first and second airplane configured to fly in the first and second patterns at an altitude less than approximately fifty thousand (50,000) feet;

said first and second patterns being varied to enable the first and second airplane to provide continuous uninterrupted coverage via first and second beam patterns, respectively, to a service area below in a weather pattern-independent and geographic feature-independent manner.

2. The communications link of claim 1, further comprising a first airport located away from a center of a coverage area of the first and second airplane corresponding to a glide-down distance of the first and second airplane.

3. The communications link of claim 2, further comprising a second airport for providing services generally redundant to those at the first airport, the second airport being situated at a location that is accessible to the first and second airplane.

4. The communications link of claim 3, further comprising a third airplane located at one of the first and second airports for providing coverage redundant to that of the first and second airplanes.

5. The communications link of claim 1, wherein the first and second airplanes comprise a first airborne coverage group, and further comprising at least one other airborne coverage group for providing services generally redundant to those of the first airborne coverage group.

6. The communications link of claim 1, wherein the first and second airplanes fly at the same altitude that is less than approximately fifty thousand (50,000) feet.

7. The communications link of claim 1, wherein the first and second airplanes fly at different altitudes that are less than approximately fifty thousand (50,000) feet.

8. The communications link of claim 1, wherein altitudes of the first and second airplanes vary according to link margin requirements.

9. The communications link of claim]1, wherein said first and second airplane are configured to fly in the first and second patterns at altitudes of approximately thirty thousand (30,000) feet.

10. The communications link of claim 1, wherein at least one of the first and second airplanes is for adjusting the first and second flight patterns, respectively, so that at least one of the first and second beam patterns is capable of circumventing a storm.

11. The communications link of claim 1, wherein the first airplane is for handing off calls to the second airplane when necessary to provide the continuous uninterrupted communications coverage.

12. An airborne link for a cellular communications system, comprising:

a first airplane configured to fly in a first pattern at a first altitude less than approximately fifty thousand (50,000) feet and configured to transmit RF beams to provide communications coverage within a first beam footprint covering a specified geographic area; and

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a second airplane configured to replace the first airplane at an end of a mission of the first airplane by establishing a second flight pattern at a second altitude less than approximately fifty thousand (50,000) feet and a second beam footprint that enables call switchover in a manner that minimizes dropped calls.

13. The airborne link of claim 12, further comprising a ground control station for directing the call switchover when the second airplane establishes a call switchover rendezvous flight pattern at an altitude less than approximately fifty thousand (50,000) feet.

14. The airborne link of claim 13, wherein the ground control station gradually switches over calls within the first beam footprint to the second beam footprint by gradually reducing output power associated with the first beam footprint to cause user handsets to switch to the second beam footprint.

15. The airborne link of claim 12, wherein the first airplane initiates the call switchover by gradually reducing output power associated with the first beam footprint to cause user handsets to switch to the second beam footprint.

16. The airborne link of claim 12, wherein the first and second flight patterns are one of parallel flight patterns and 180° out-of-phase flight patterns.

17. A method of switching calls over from an original airplane-based communications link in a cellular communications system to a replacement airplane-based communications link, comprising:

maintaining a first airplane in a first flight pattern at an altitude less than approximately fifty thousand feet (50,000) to provide continuous coverage over a designated geographic area through a first communications link;

flying a second airplane up to a predetermined flight pattern having a predetermined altitude less than approximately fifty thousand feet (50,000) to establish a second communications link over the designated geographic area;

moving calls carried on the first communications link to the second communications link according to a predetermined switchover protocol; and

flying the first airplane out of the first flight pattern after all of the calls have been switched over to the second communications link.

18. The method of claim 17, wherein the moving of calls is a ground control-based operation.

19. The method of claim 17, wherein the moving of calls is a power control-based operation in which power of the first communications link is gradually reduced to enable calls on the first communications link to be gradually handed off to the second communications link.

20. The method of claim 17, wherein the moving of calls is a split spectral resources-based operation in which a percentage of spectral resources assigned to the second communications link is gradually increased until 100% of all spectral resources are assigned to the second communications link.

21. A method of providing cellular communications coverage using an airplane based antenna array, comprising:

establishing cellular communications coverage over a predetermined geographic area via a first generally circular flight pattern with an outer point thereof being tangential to a circumscribing flight pattern circle having a radius larger than that of the first flight pattern;

if a weather pattern affects the communications coverage, moving from the first flight pattern along the circumscribing flight pattern circle until a new operating point corresponding to a point of an alternate flight pattern that is tangential to the circumscribing flight pattern is reached; and

executing the alternate flight pattern having a radius similar to the first flight pattern to maintain the cellular communications coverage over the predetermined geographic area.

22. The method of claim 21, further comprising adjusting the cellular communications coverage during the moving from the first flight pattern to maintain the cellular communications coverage over the predetermined geographic area.

23. The method of claim 22, wherein the moving from the first flight pattern further comprises at least one of turning beams providing the cellular

communications coverage on/off and re-shaping the beams providing the cellular communications coverage.

24. The method of claim 21, wherein the moving from the first flight pattern is an airplane-based function.

25. The method of claim 21, wherein the moving from the first flight pattern is a terrestrial-based function.